

SUBJECT: Trip Report: American Nuclear Society
Winter Meeting - Washington, D. C.,
November 10-14, 1968 - Case 100

DATE: November 21, 1968

FROM: C. P. W

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MEMORANDUM FOR FILE

The American Nuclear Society Winter Meeting was held at the Sheraton-Park Hotel, Washington, D. C., on November 10-14, 1968. Possible aerospace applications of nuclear technology that were discussed included remote manipulators, spacecraft leak detection, and miniature electrical power supplies.

Remote Manipulators

Recent studies for NASA and USAF indicate that mechanical manipulators ("master slaves") may effectively perform EVA tasks in space. Time and motion studies by the Argonne National Laboratories have shown that simulated space tasks can be accomplished by a shirt-sleeved operator using a master slave manipulator about equally as well as an astronaut in a pressurized Apollo soft suit. In either approach, the time was about three times that required to do the task directly by hand.

General Electric showed an impressive film which demonstrated replacement of an electronic module (or film pack?) by a master slave manipulator. The task involved (1) removing four screws, (2) disconnecting two electrical connectors (pigtail), (3) removing and replacing the module, and (4) refastening the screws and connectors. The total task took about five minutes. Television cameras located on the slave's arms in the work area gave the operator much better control of the proceedings than direct visual observation.

The only cautionary note was injected by representatives of the Naval Ship Engineering Center who have had considerable operational experience with underwater remote handling systems on deep submersible vehicles. Although their situation is considerably different from the space environment, they did report that it took a remote manipulator eleven hours just to fasten a line to the lost Palomares bomb. Principal reasons for the difficulty were (1) relative motion between the submersible vehicle and the bomb due to ocean currents and crew motion, and (2) the observation window used by the submersible's operator to view the work area was a different window than the one used by the master slave's operator.

(NASA-CR-100886) AMERICAN NUCLEAR SOCIETY
WINTER MEETING, WASHINGTON, D. C., 10-14
NOVEMBER 1968 TRIP REPORT (Bellcomm, Inc.)

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Spacecraft Leak Detection

TRW described the development and use of a Krypton-85 radiotracer leak detector. The system is used to measure leak rates from the pneumatic and propulsion systems of integrated spacecraft and from individual components. Total gas leak rates as small as $0.1 \text{ cm}^3/\text{hr}$ can be measured - a sniffer probe is incorporated into the detector which can locate individual leaks smaller than $1 \text{ cm}^3/\text{hr}$. The advantages of the technique are that it is used at ambient pressure and that the measurements are made rapidly (in two hours or less).

Miniature Electrical Power Supplies

The DW Douglas Laboratories discussed their development of a miniature, radioisotope-fueled, thermionic power supply capable of delivering electrical power in a range of below a milliwatt to over a watt. Using emitter temperatures of about 500°C , promethium-fueled devices of this type have been successfully operated for over 5000 hours in continuing life tests with no degradation in thermionic performance.



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C. P. Witze

BELLCOMM, INC.

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